ANALYZING THE EFFECTS OF COVID-19 IN FAIRFAX COUNTY PARKS AND ON CLIMATE CHANGE COMMUNICATION

by
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Abstract

In 2019, a zoonotic disease jumped from animals to human and spread rapidly through respiratory droplets. It came to be known as COVID-19. The pandemic led to closures of universities, movie theaters, fitness centers, and many other facilities. Prominently, among those closures were parks and public lands. Upon observing spikes in park visitation in Fairfax County following a phased reopening, this study aims to find whether the spikes are part of annual trends by analyzing internal data collected from the county and sending out a survey to the general Northern Virginia community.

The county data was analyzed quantitatively using tables and charts to show visual trends. The community survey was analyzed using a statistics software that showed variances, generated histograms and displayed normal curves.

The results indicated that attendance at outdoor facilities had increased in 2020 compared to previous years, but that certain activities had declined, possibly due in part to government-imposed restrictions and general public anxiety. However, indoor facilities showed a marked decline compared to previous years. People's concerns about fighting climate change had somewhat increased since the beginning of the pandemic, and about a quarter of the respondents stated that they observed similarities between the COVID-19 pandemic and the climate change crisis.

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Introduction

Imagine a person who is used to being outside of their home. Perhaps the person works in an office or at a university. The person is used to commuting daily - either by car, bicycle, train, or on foot. Their home is seen as a sanctuary, a place to eat, spend time with family, and to sleep.

Suddenly, an outbreak of disease forces everything to close down. The person is now trapped at home. They are either telecommuting, laid off, or on administrative leave.

This is not a hypothetical scenario.

It has happened.

Due to the 2020 novel coronavirus pandemic, businesses, public lands, and universities, among other facilities shut their doors, forcing employees and the public alike to stay at home in order to remain safe.

This study explores the question of whether the COVID-19 pandemic has led managed parks, including lakefront parks, a working farm, golf courses, nature centers, and historical sites, in Fairfax County, Virginia to experience a spike in park visitors. The topic will be further delved into by discussing whether the broad cross-cultural message of "We are all in this together" could be applied toward climate change communication.

This study is significant in its ability to prepare parks, trail management associations, and other land conservancies for other potentially similar situations, or spikes in COVID-19 diagnoses that would force facilities to close again. The information gleaned from this study could guide managers to formulate a plan of action for any future scenarios. Additionally, having unified much of the community under the mantra of "We are all in this together," with various behavior modification strategies, the concept of working together to "flatten the curve" could be helpful toward doing the same in regard to climate change.

This paper will be organized with a deep dive in the background and history of SARS-CoV-2, its impact on parks and public lands, and how the community came together to flatten the curve of further disease outbreaks. The paper will finish with a summary and analysis of collected data and recommendations.

Background

Set the stage: Wuhan, China, in the fall of 2019. An unknown virus jumped from animals to humans. It is believed that the virus jumped from animals to humans at a wet market, which would allow opportunity for zoonotic diseases to infect a human (Ji, Wang, Zhao, Zai, & Li, 2020). This virus, highly contagious, spread through respiratory droplets and a lack of social distancing. Officials announced on December 31, 2019 that they were investigating a respiratory illness outbreak and released an epidemiological alert (Huang, et al., 2020). On January 21, 2020, the first confirmed case of the virus, SARS-CoV-2, was reported in the United States (CDC, 2020), although current research indicates that the virus may have spread earlier than expected (Deslandes et al., 2020).

Two months after the first confirmed case of COVID-19, the Fairfax County Park Authority in Fairfax County, Virginia, made the decision to close all of its parks, including recreational centers, playgrounds, and parking lots (Moran, 2020). Fairfax County Park Authority is home to more than four hundred parks, including four large lakefront parks, several historic sites, two nature centers, nine recreational centers, golf courses, and boasting more than two hundred miles of trails within a total of 22,000 acres (Park Authority, n.d.). On March 30, the governor of Virginia, Ralph Northam, issued a stay at home order, to remain in place until June 10 (Governor Northam Issues Statewide Stay at Home Order, 2020).

It has been observed that even in areas with mandated stay at home orders, such as the Commonwealth of Virginia, people were visiting parks and public lands in droves. Cars would be parked along the sides of busy roads as people trekked into parks with gates shut in order to take advantage of trails and other amenities.

On May 20, 2020, Fairfax County started a phased reopening of their outdoor park facilities, while keeping offices, recreational centers, and nature centers closed (Phased

Reopening of Fairfax County Parks Begins in Time for Memorial Day Weekend, 2020). In the midst of a global pandemic and after being ordered to stay home, it seemed as though Fairfax County residents were beginning to realize what they had taken for granted.

In a recent Vox article, Sigal Samuel discusses the habits people have picked up during the pandemic would like to continue (Samuel, 2020). Five of the eight habits could easily be applied by visiting parks: slowing down and smelling the roses – so to speak, putting family and friends higher on an individual's list of priorities, activism, moving their bodies daily, and spending more time outdoors (Samuel, 2020).

The eight habits discussed by Samuel (2020) all have positive effects. There has been multiple research studies on the benefits of nature on mental health, such as "Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature" (Cox et al., 2017). The authors found, through studies, that those who lived in neighborhoods with more abundant plants and birds experienced less mental health issues (Cox, et al., 2017). Additionally, a study showed that people who spend time outside recreationally exhibited lower cortisone levels than those who stayed indoors and watched television, indicating that people who are outside in nature are typically less stressed, leading to improved physical health (Olafsdottir et al., 2020). A study done in South Korea showed that people who socially distanced in order to protect themselves from becoming sick were more likely to remain healthier due in part to physical activity and maintaining hygienic habits (Park, Kim, & Lee, 2020).

Climate change, like the coronavirus pandemic, is a global threat that requires individual and community cooperation at an unprecedented spatial and temporal scale. Individuals have to think about the well-being of others and themselves at the same time. Like climate change, it boils down to risk perception, values, and worldview. And, like climate change, it is easily

becoming a politized science. Starting before the Obama administration in 2008, and possibly even earlier than the Bush administration, strategies to mitigate climate change by reducing greenhouse gas emissions was a political issue (Dunlap, McCright, & Yarosh, 2016). Through the Obama presidency and into the current Trump administration, climate change turned into an issue covered in political debates, and on the ballot (Dunlap, McCright, & Yarosh, 2016). A similar effect is observed during the pandemic, as outlined in a 2020 study, "Politicizing the COVID-19 Pandemic: Ideological Differences in Adherence to Social Distancing" (Rothgerber, et al., 2020). The researchers theorized that the political divide may be due to a distrust of media, the degree of trust in science, and the level of pandemic-related anxiety (Rothgerber, et al., 2020).

Research Purpose and Questions

The purpose of this study was to evaluate whether the COVID-19 pandemic has affected usage of public lands in the Fairfax County Park Authority system. Additionally, this study explored the idea of whether "We are all in this together" could be applied toward climate change communication.

The first research question (RQ1) asks, "To what extent did the COVID-19 pandemic affect managed park visitation in Fairfax County, namely in terms of camping, classes, and recreation?"

The second question (RQ2) asks, "To what extent did the broad, cultural-level message that 'we are all in this together' affect people's use of public lands?"

The third question (RQ3) asks, "To what extent do people perceive that the broad, cultural-level message that 'we are all in this together' has been effective in encouraging behaviors that flatten the COVID-19 infection curve?"

The final question (RQ4) asks, "Does receptivity to 'we are all in this together' messaging make one more receptive to climate change mitigation?"

Methodology

This study took a mixed methodology approach to addressing the research questions. The first research question asked, “To what extent did the COVID-19 pandemic affect managed park visitation in Fairfax County, namely in terms of camping, classes, and recreation?” The question was measured quantitatively in part by taking the data from car counts from managed parks that have had a car counting device installed for more than one season. Furthermore, further data collection was performed by considering different revenue-generating factors, depending on the type of facility. For example, lakefront parks monitored park attendance and revenue generation by recording camping reservations, car counts, boat rentals, and amusement tickets. While this data is not freely available to the public, it is available to Fairfax County employees on an internal shared server, and the researcher, as a Fairfax County employee, was granted permission to use this data for this study.

For Research Questions 2 through 4, conclusions are based on an emailed survey instrument distributed to users of Fairfax County parks and sent to those who were associated with Fairfax County Parks either as an employee or as a visitor. After general demographic questions, the interviewees were asked about their use of public lands during the pandemic, their views on the effectiveness of the “we are all in this together” messaging, and their attitudes on climate change.

Results

RQ1: To what extent did the COVID-19 pandemic affect managed park visitation in Fairfax County, namely in terms of camping, classes and recreation?

Total annual counts, especially for Lakefront parks (Table 1) and golf courses (Table 2) do not show a lot of significant differences in park use and visitation. However, lakefront parks and golf courses do not have a lot of indoor activities, if any, and people have the ability to recreate outdoors while still maintaining a social distance. Data available for 2020 is only up until October, as it takes time for the data submitted from individual sites to be analyzed.

Figure 1, Figure 2, and Figure 3 show the monthly trends of lakefront parks with and how each month may show similarities or differences between years. In June of 2020, there is a spike in car counts comparable to June of 2018. However, lakefront parks showed a higher car count in 2020 summer months (June, July and August) compared to prior years.

Table 1

Annual Lakefront Metrics

	Car Counts	Campsite Rentals	Boat Rentals	Amusements
2017	2,526,658	8612	13,212	234,120
2018	2,248,827	7956	9,722	86,315
2019	2,025,942	10,659	12,138	105,701
2020	1,789,016	4,104	10,067	35,296

Note: Data covers the three lakefront parks in Fairfax County: Lake Fairfax Park, Burke Lake Park, and Lake Accotink Park.

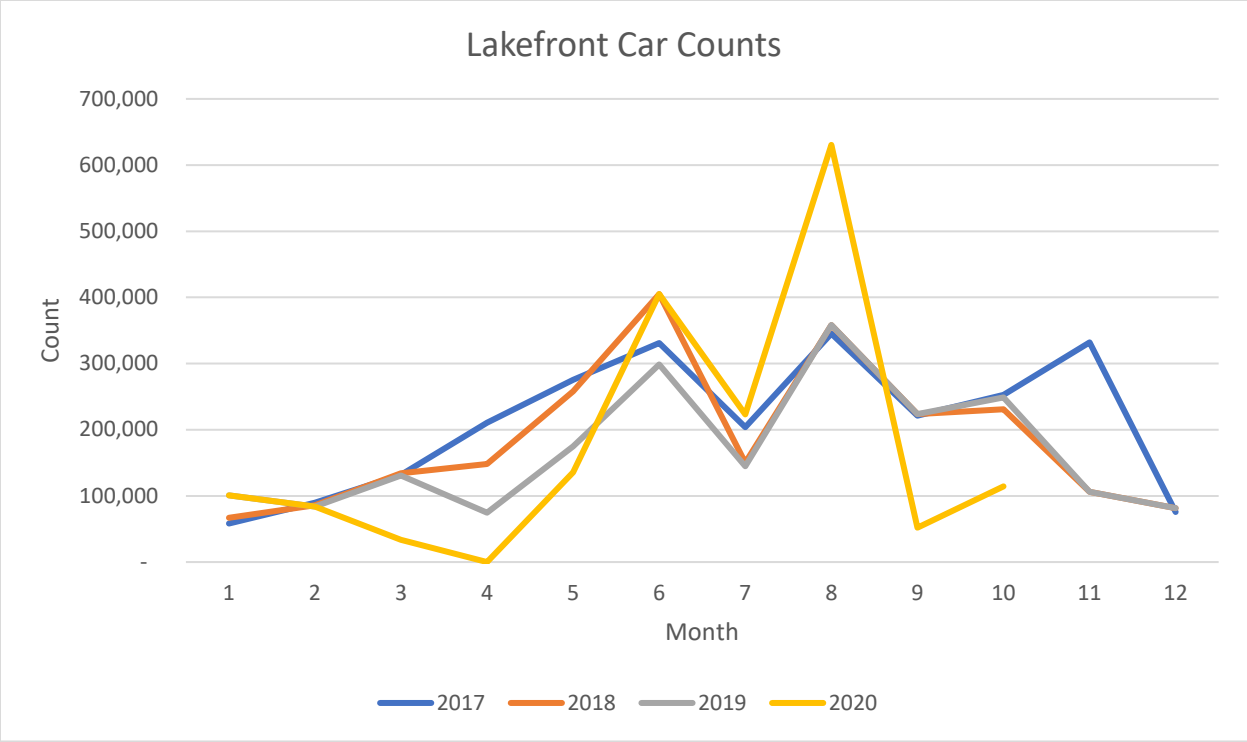

Figure 1: Month-to-month lakefront parks car counts between 2017 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Figure 2 shows the total of campsite rentals at lakefront parks between 2017 and 2020. In March and April of 2020, the data line dips below zero. This indicates campsite cancellations amid the pandemic and while the parks were closed to the public. With parks being closed, that also meant that the campgrounds at Lake Fairfax Park and Burke Lake Park were closed. County employees canceled and refunded all camping reservations through June. While the graph shows that campsite reservations were not as in-demand as in previous years due to travel restrictions and pandemic-related anxiety, after the initial shutdown, the trend indicated a positive growth throughout the summer months and a slight decline in October.

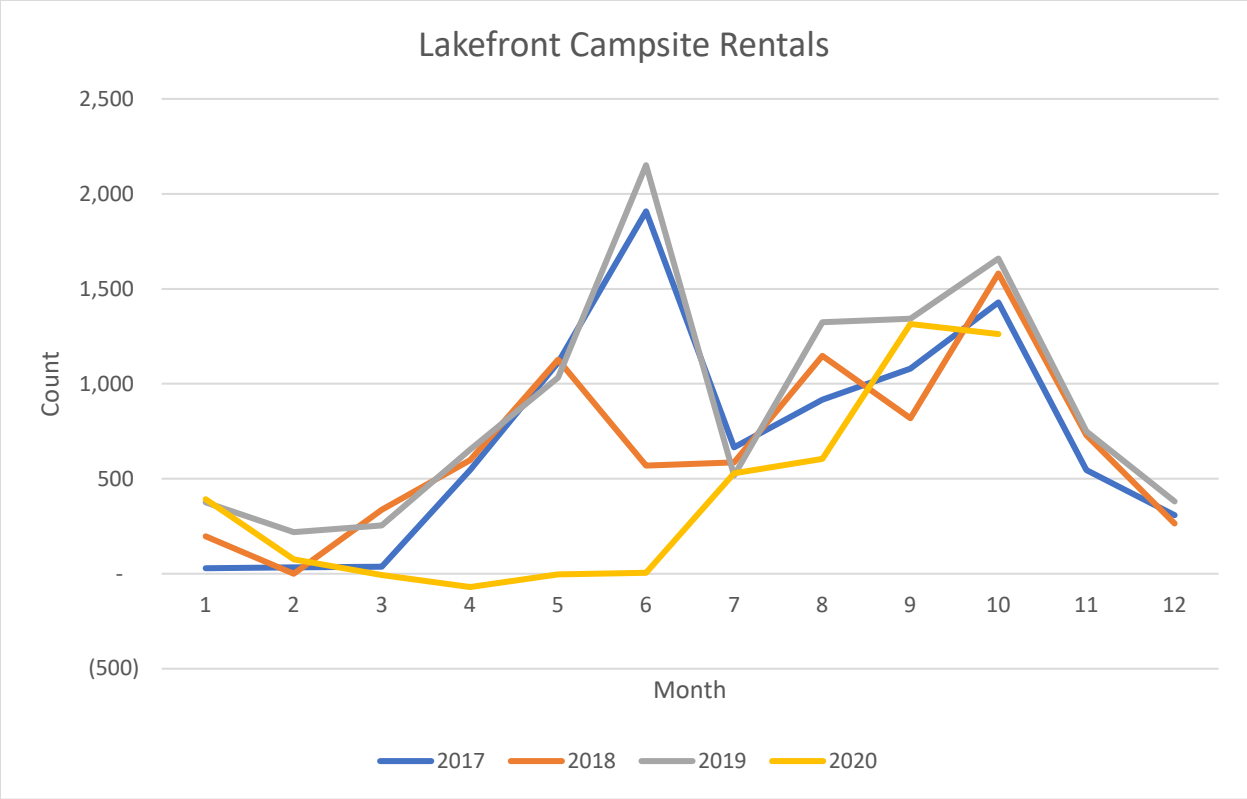

Figure 2: Annual month-to-month counts of lakefront campsite rentals between 2017 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Lakefront amusement activities (Figure 3) include carousel rides and train rides. Amusement activities are usually available when the weather is more predictable, beginning in late February or March and generally ending in November or December. Due to the pandemic, some amusements were not available at some sites, such as the trackless train at Lake Fairfax Park. Additionally, limited tickets were available per time slot in order to promote social distancing between park visitors on the carousel and trains. Parks also needed to allow for time in between rides to sanitize equipment, such as train seats and carousel horses. As a result, 2020 amusement ticket sales were lower than in prior years.

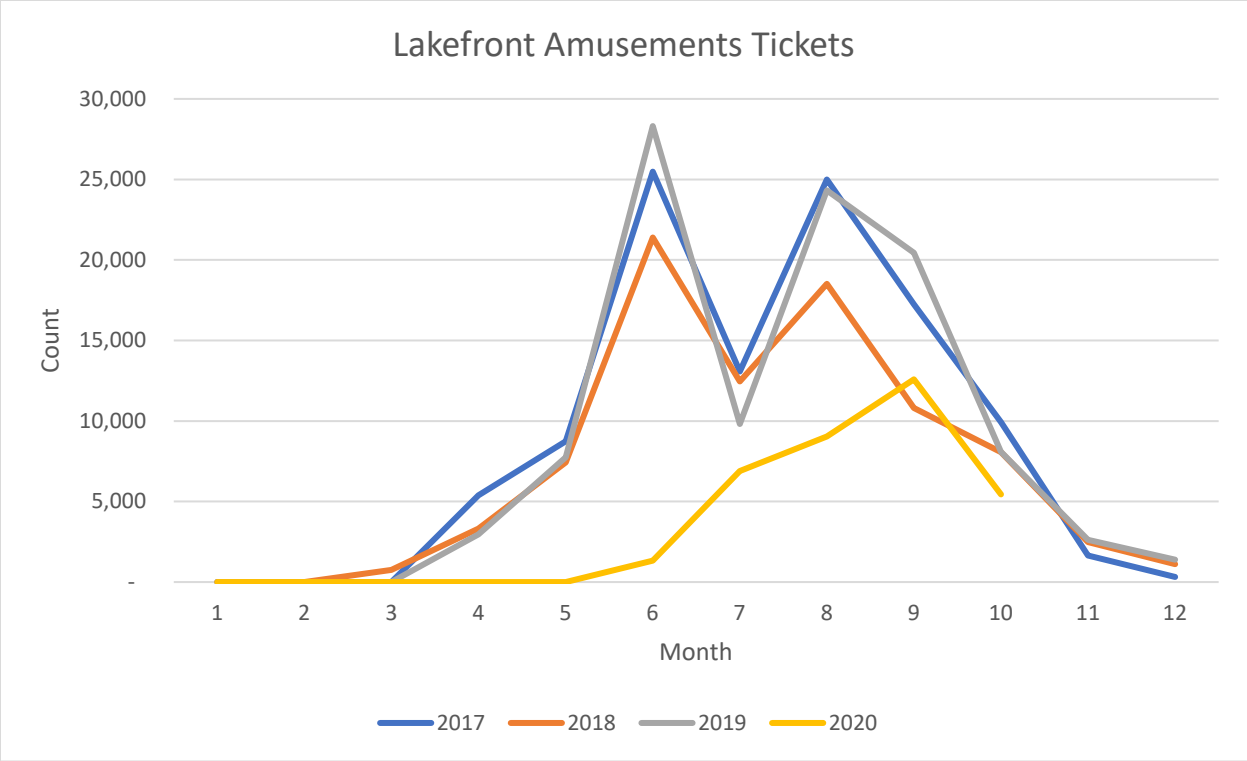

Figure 3: Annual month-to-month counts of lakefront amusement tickets sold between 2017 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

All of the lakefront parks offer boat rentals during the warmer months (Figure 4). Most sites start boat rentals in May and continue until Labor Day, although some sites begin before May and continue as long as the warm weather continues. Due to government regulations, parks could not rent out boats until late June 2020, when Virginia reached Phase 2 in the Forward Virginia Plan. In Virginia, there are four phases in reopening the Commonwealth after the initial scaling back and stay-at-home orders. Phase 2 allows for a maximum of fifty people for social gatherings or 50% of total occupancy, enhanced sanitation guidelines, and continued physical distancing practices (Forward Virginia Guidelines, 2020). In Figure 4, that is why there is a one-month lag time in the 2020 boat rental peak, compared to previous, non-pandemic years.

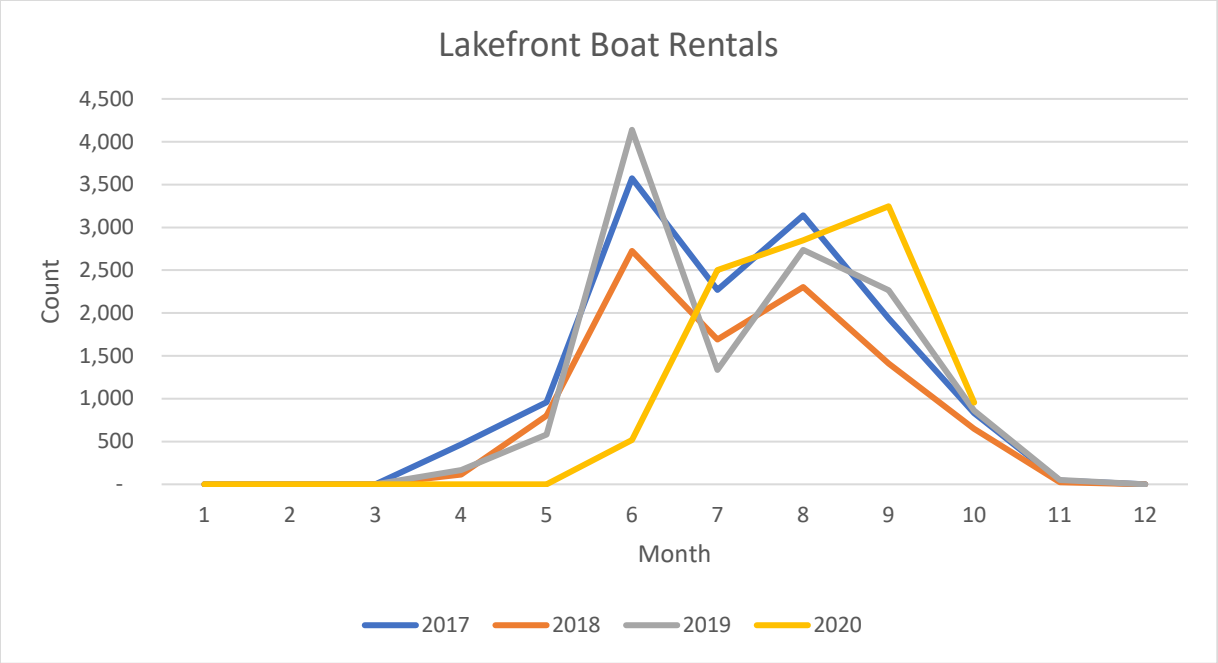

Figure 4: Annual month-to-month counts of lakefront boat rentals and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Golf is an outdoor activity, and so the annual metrics for 2020 (Table 2) does not show significant differences compared with prior years. Data for the year 2017 was not available for comparison.

Table 2
Annual Golf Metrics

	Golf Rounds	Miniature Golf Rounds	Class Attendance	Event Attendance
2018	215,067	15,052	2,121	10,017
2019	243,479	13,669	2740	6891
2020	240,955	0	318	2386

Note: Data covers the seven golf courses in Fairfax County: Burke Lake, Greendale, Jefferson, Pinecrest, Twin Lakes, Laurel Hill, and Oak Marr.

Figure 5 shows month-to-month rounds of golf sold across the county, compared against other years. After forty refunded golf rounds in April and a slow increase in May, the numbers of rounds sold reached 63,525 in June and continued to trend higher than prior years throughout the summer and fall, with the exception of August, in which 2020 sales were lower than 2018.

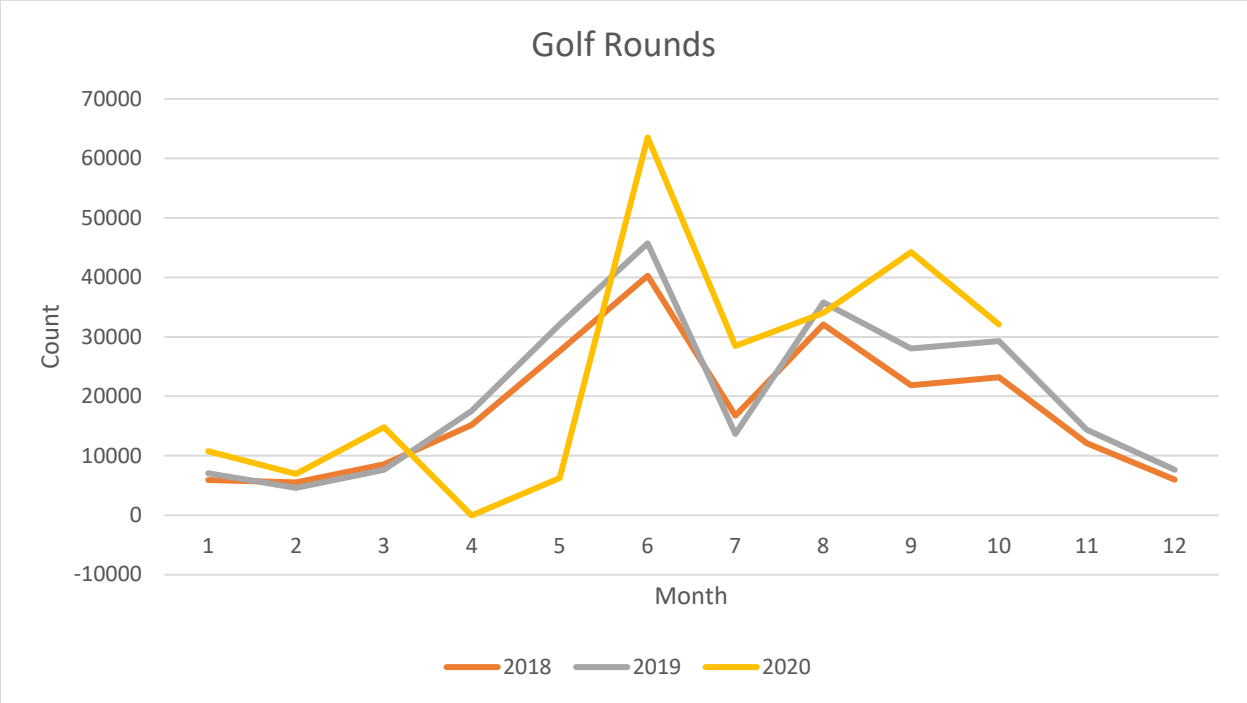

Figure 5: Annual month-to-month counts of individual golf rounds sold between 2018 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Miniature golf (Figure 6) is available at four parks: Lake Accotink Park, Burke Lake Park, Jefferson Falls Mini Golf Course, and Oak Marr Golf Course. However, mini golf courses were closed for renovations during 2020 and so did not sell any rounds.

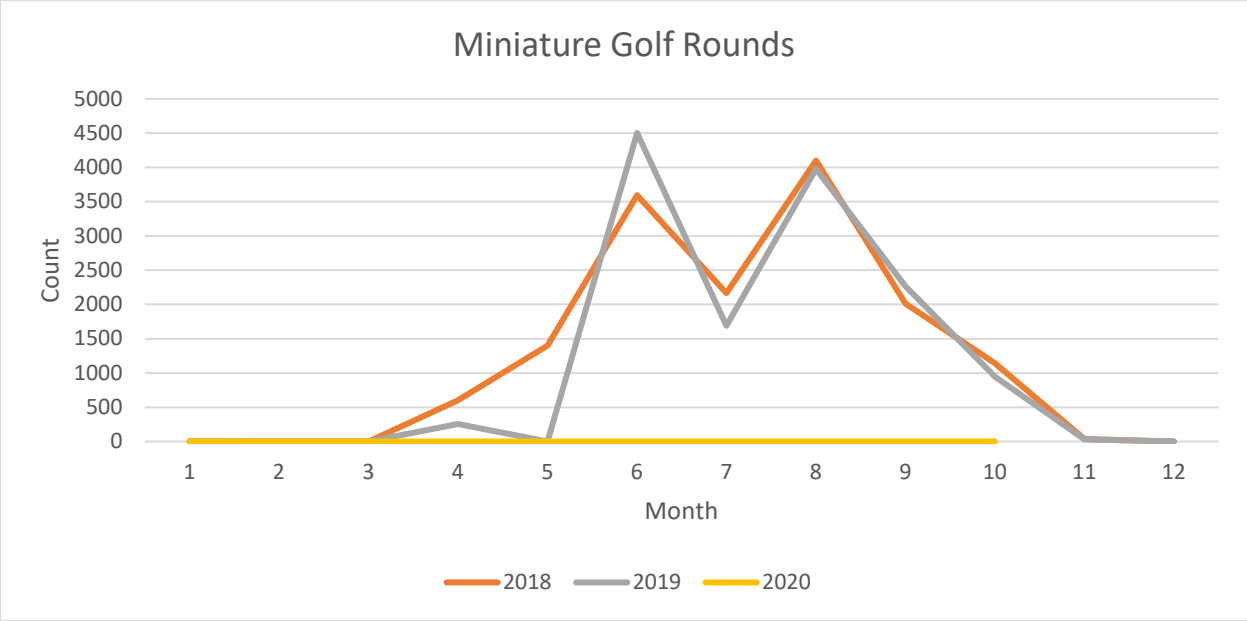

Figure 6: Annual month-to-month counts of individual miniature golf rounds sold between 2018 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Golf courses throughout Fairfax County offers instruction in a variety of techniques and skills for all levels and ages. Due to pandemic-related closures, the golf courses did not offer classes until June 2020. Compared with previous years, classes did not do well at golf courses (Figure 7) probably in part due to instructor reluctance to work closely with the public for fear of virus spreading and vice versa.

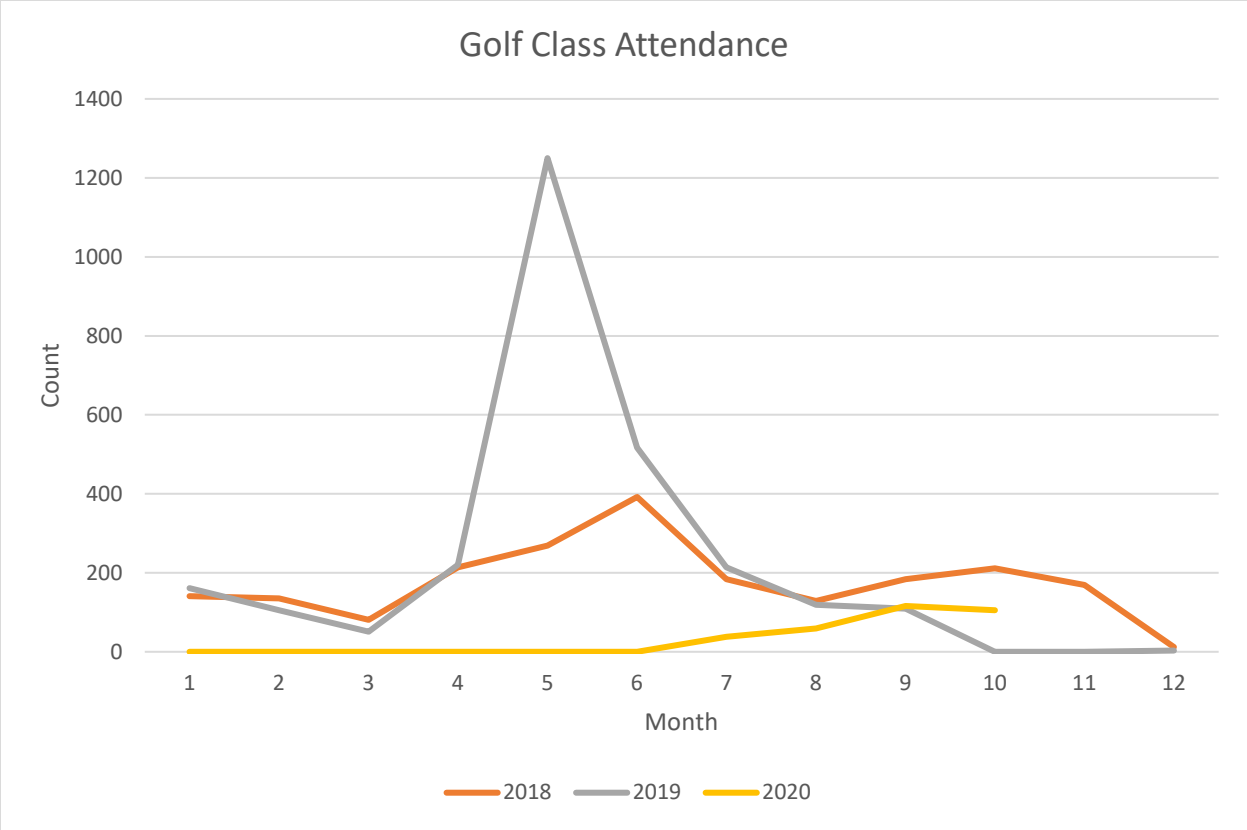

Figure 7: Annual month-to-month counts of individuals attending golf classes between 2018 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Fairfax County golf courses host events and in-house tournaments year-round. Players qualify for and buy spots in tournaments. With rising concerns about the pandemic, 2020 tournament and event attendance were lower than in previous years (Figure 8). However, starting in June, golf courses started hosting tournaments and events with limited participant and crowd size. As a result, even though the total number of tournament and event participants slowly increased throughout 2020, the total number of participants is still lower than in 2018 and 2019.

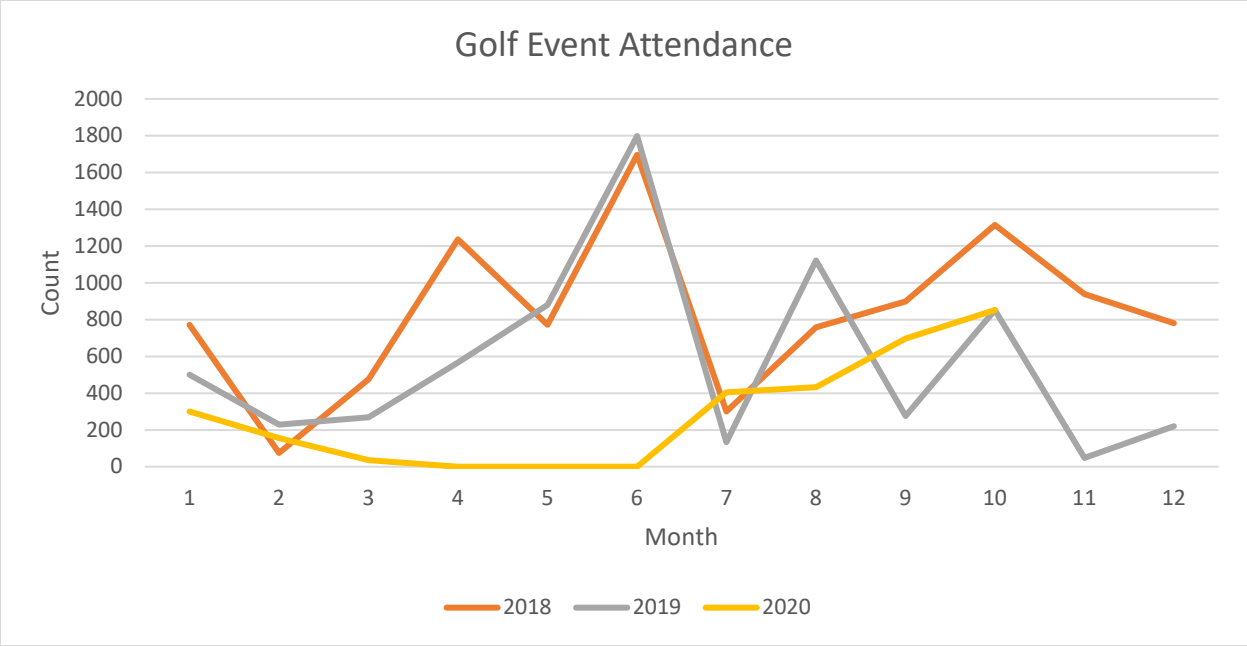

Figure 8: Annual month-to-month counts of individuals attending golfing events between 2018 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

During the pandemic, recreational centers, or as Fairfax County Park Authority calls them, RECenters, did not do well, as indicated in Table 3. General admissions are one-time purchases to use RECenter facilities, such as the pool, locker rooms, and fitness rooms. Pass admissions indicates people who have purchased 6-month or 12-month passes which allows users access to all RECenter facilities and amenities as frequently as liked. RECenters also hosts a variety of programs, including swimming and fitness classes. The public is able to rent various fee-based areas, such as ice-skating rinks or private rooms for parties, which falls under "Rental Attendance" in Table 3.

Table 3
Annual RECenter Metrics

	General Admissions	Pass Admissions	Program Attendance	Rental Attendance
2017	234,800	1,201,385	339,639	35,480
2018	204,133	1,150,870	294,949	213,094
2019	204,485	1,140,587	381,942	50,780
2020	69,269	412,516	100,063	14,751

Note: Data covers the nine RECenters in Fairfax County: George Washington, Lee, Mt. Vernon, Oak Marr, Providence, South Run, Spring Hill, Cub Run, and Wakefield.

When Fairfax County Park Authority reopened in late May with Phase 1 of the Forward Virginia plan, which allows for only gatherings of twenty-five people at a time, physical barriers between individuals or groups, strigent cleaning procedures and physical distancing protocols (Forward Virginia Guidelines, 2020), RECenters remained closed due to Phase 1 restrictions. As Virginia entered Phase 3 in July, RECenters were able to open again. Phase 3 allows for gatherings up to 250 people with continued mask wearing, physical distancing protocols, and enhanced sanitizing procedures (Forward Virginia Guidelines, 2020). However, people were required to make reservations and show up at their prearranged time to promote social distancing and indoor occupancy restrictions (Park Authority RECenters, n.d.). As a result, general admissions (Figure 9) and pass admissions (Figure 10) were significantly lower than in prior years.

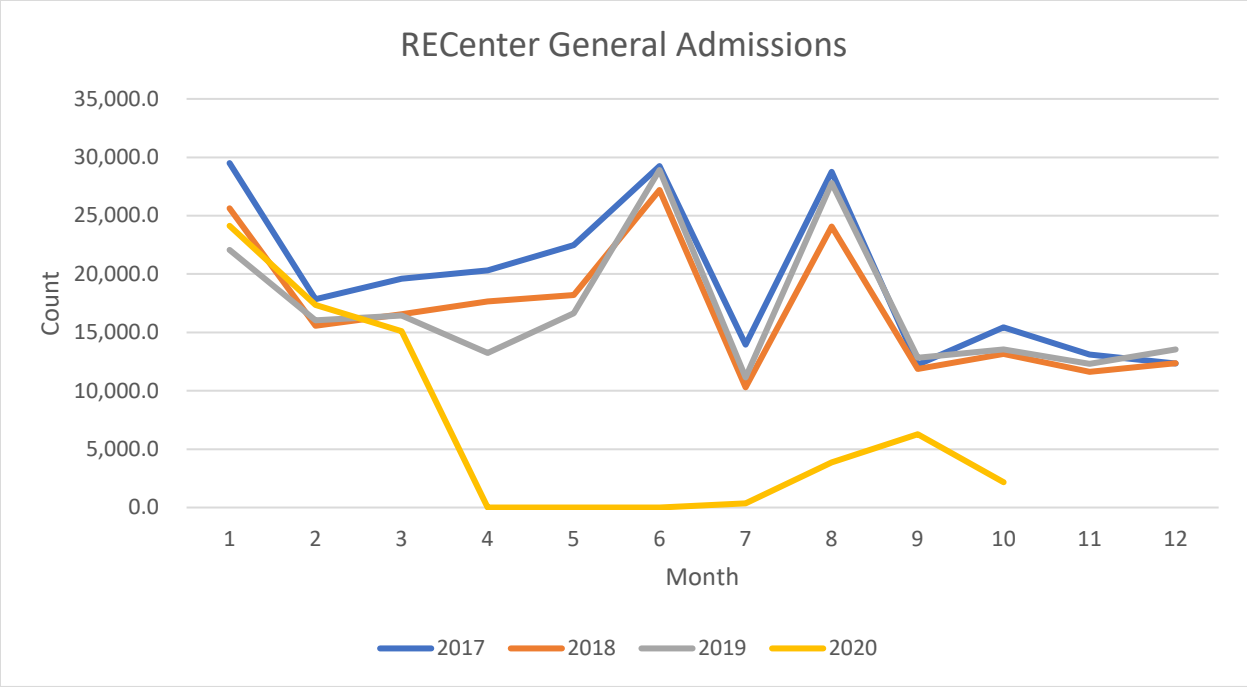

Figure 9: Annual month-to-month counts of individual RECenter admissions between 2017 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

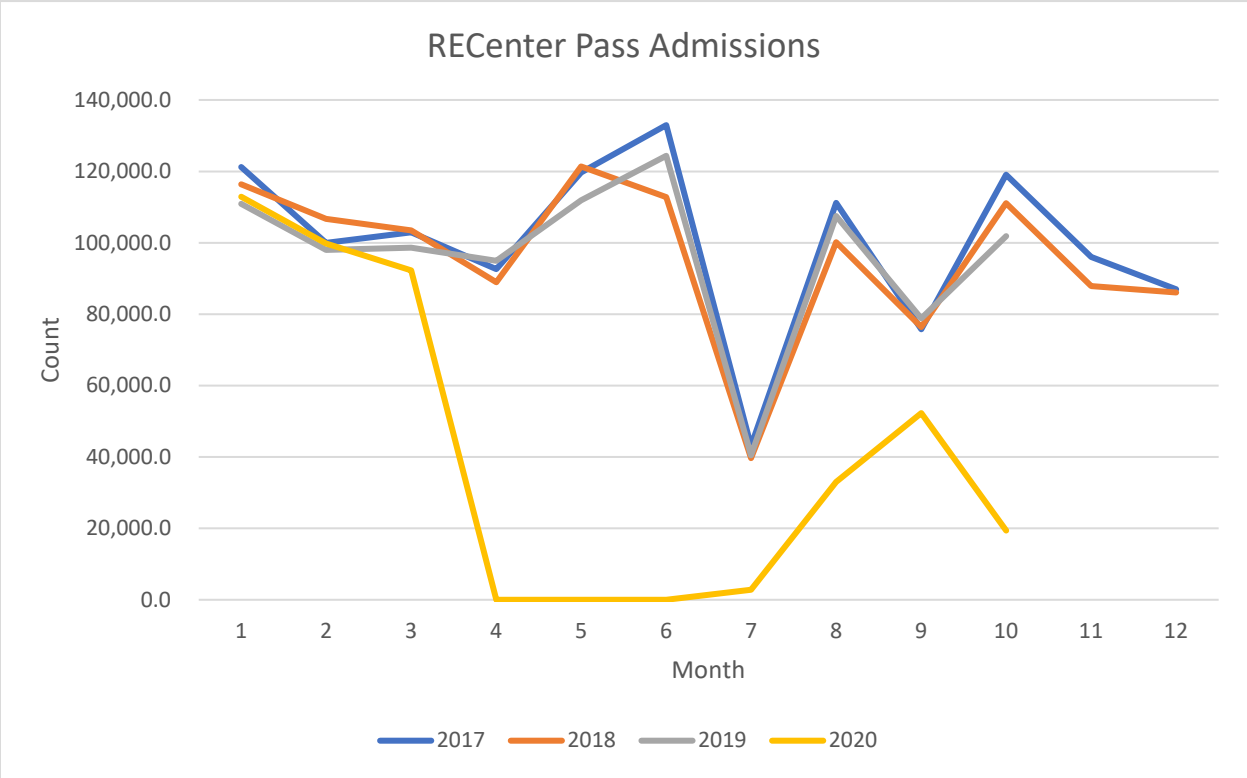

Figure 10: Annual month-to-month counts of RECenter passes used between 2017 and 2020. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

Throughout the early 2020 shutdown, all classes and programs were canceled due to public health protocols and social distancing regulations. Only in August were RECenters able to offer limited classes and programs (Figure 11) with very limited seats. However, due to public and instructor reluctance, RECenter classes have not done as well as in previous years, with only 5,838 class participants in October 2020 as compared to 42,888 in 2017, 38,005 in 2018 and 36,451 in 2019.

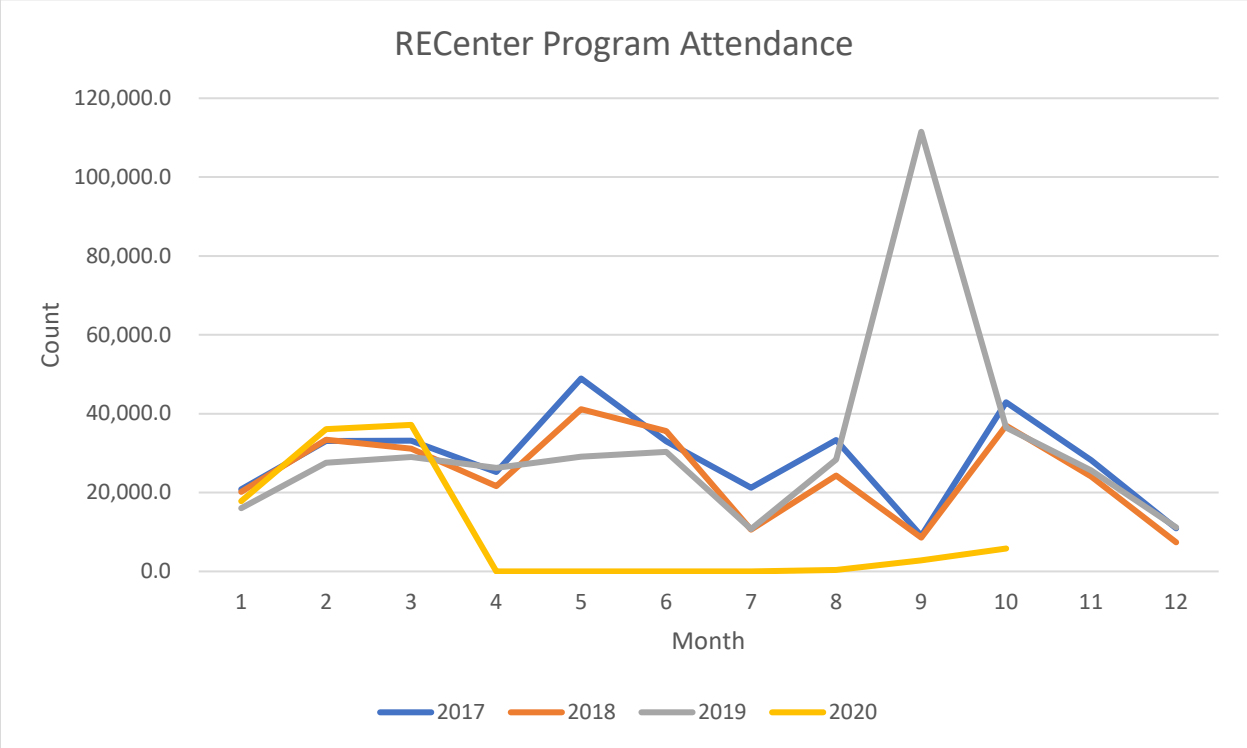

Figure 11: Annual month-to-month counts of RECenter program attendees. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

After April of 2020, RECenter facilities were not available for rental, in order to minimize the spread of COVID-19 (Figure 12). Facilities normally available for rental include pools, obstacle courses, party rooms, field houses, and an ice arena. Due to minimized group sizes, mask mandates, and sanitizing protocols, it was safer for the public for facility rentals to be unavailable for the duration of the pandemic. In January 2020, there were 6438 users of rented

facilities (Figure 12). That number declined as cases of COVID-19 in the US grew, with 4196 facility users in February and 3688 users in March. Figure 12 also indicates a drop in facility rental attendance for June through August in 2018, as well as a reduced number of facility attendance in 2017 and 2019. This is in part due to summer camps being held at RECenter facilities, blocking off the ability for others to rent the facilities.

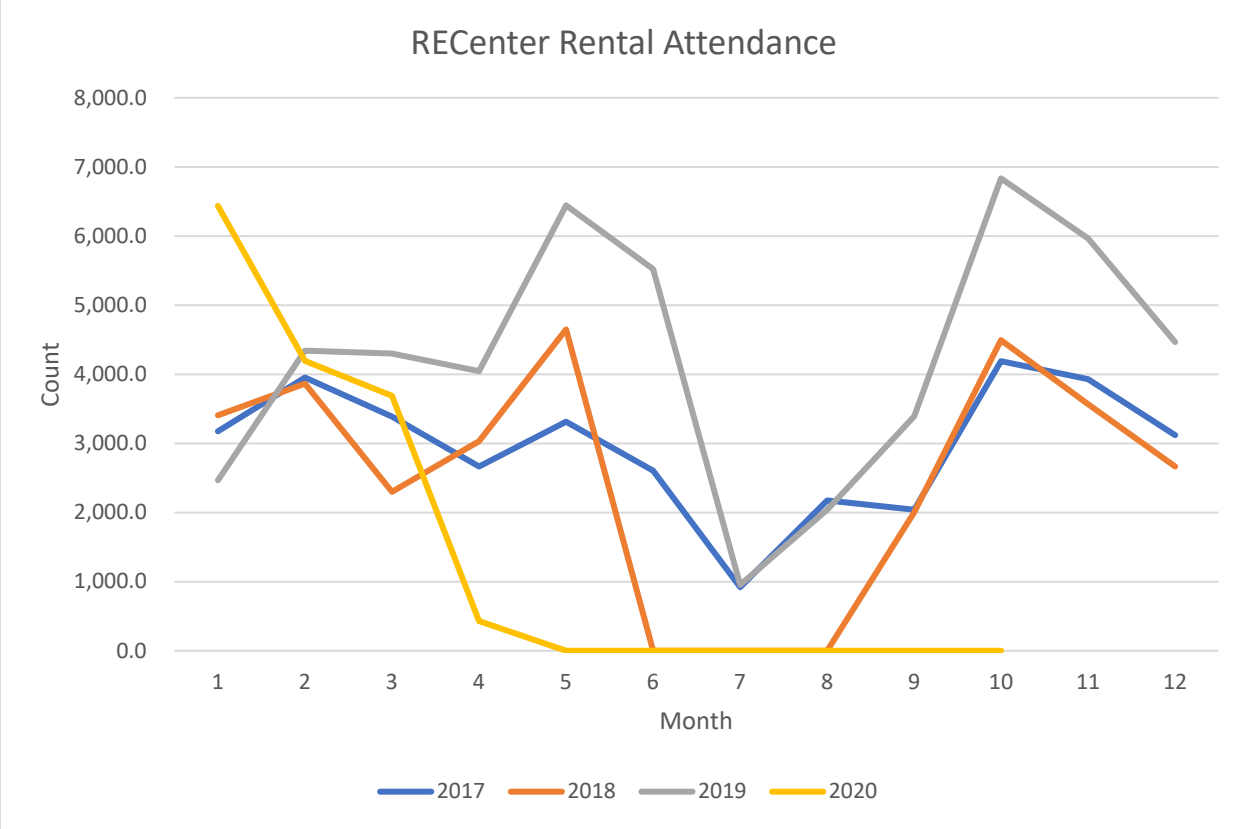

Figure 12: Annual month-to-month counts of people renting RECenter facilities. Along the X axis, "1" corresponds to January, "2" to February, and so on to "12" meaning December.

A survey was deployed among Fairfax County park users in October and November 2020. One of the questions in the survey asked participants, "During the COVID-19 pandemic, I observed an increase in park attendance at Fairfax County parks." Respondents chose among five Likert-scale options: "Strongly agree," "Somewhat agree," "somewhat disagree," and "strongly disagree." The responses were coded as 2 for "Strongly agree," 1 for "Somewhat agree," -1 for "Somewhat disagree," and -2 for "Strongly disagree." The mean was 1.21, indicating more

respondents agreed with the statement that there was a perception of increased park use. If the mean was zero, that would indicate that overall, there was no perception of increased park use. A negative mean would indicate that more respondents perceived less park use. With that in mind, a positive mean shows that respondents perceived an increase in park use. The standard deviation was 1.207 (Figure 13).

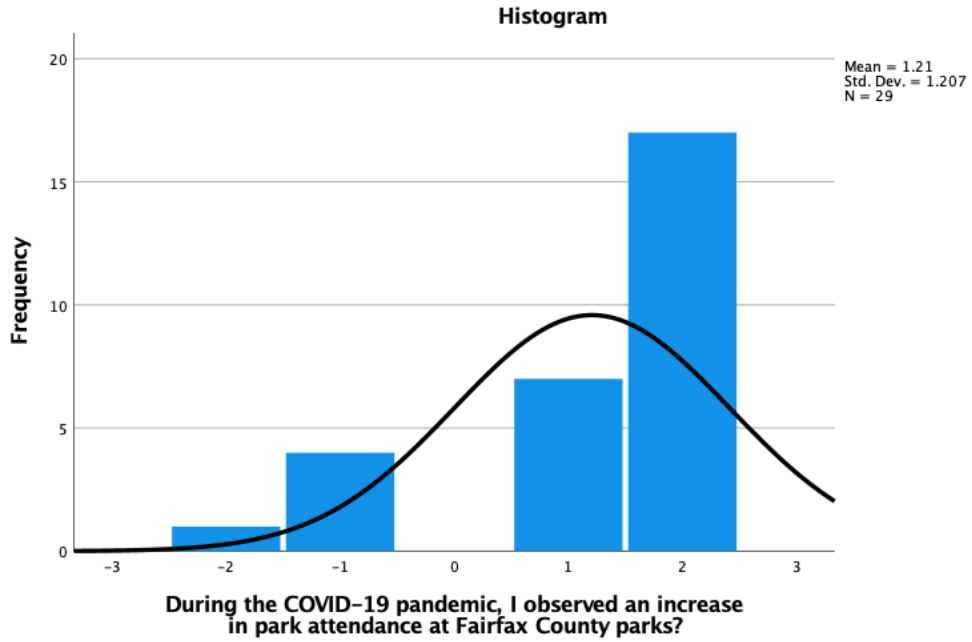

Figure 13: A histogram showing the survey responses to the statement, "During the COVID-19 pandemic I observed an increase in park attendance at Fairfax County parks."

RQ2: To what extent did the broad, cultural-level message that "we are all in this together" affect people's use of public lands?

There were three questions on the survey to address RQ2. The survey asked respondents, "How has your attitude toward public lands changed as a result of the pandemic?" Respondents chose among three options: "Yes, improved," "No, worsened," or "Stayed the same." The responses were coded as 1 for "Yes, improved," -1 for "No, worsened," and 0 for "Stayed the same." Results indicated that the mean was 0.31 with a standard deviation of 0.47 (Figure 14), indicating that most people responded neutrally with "Stayed the same" or positively with "Yes,

improved." The mean was 0.31. With a positive mean, it indicates that there was a slight improvement in people's attitudes toward public lands. Figure 14 also only shows two bars in the graph, and not three – the number of responses. This is because none of the respondents indicated that their attitude toward public lands had worsened as a result of the pandemic.

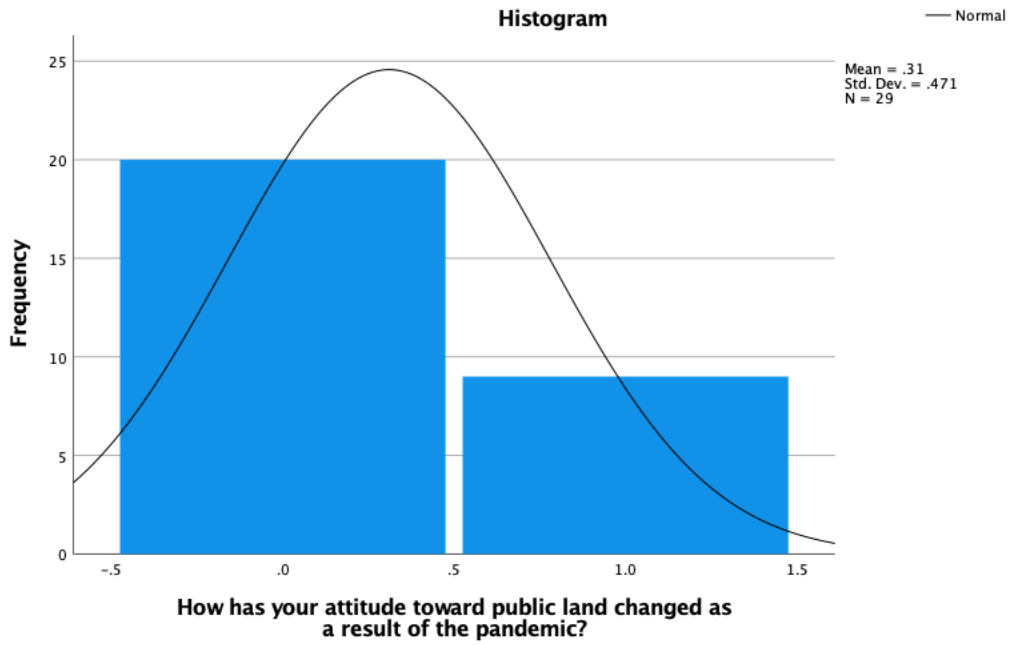

Figure 14: A histogram showing the mean and standard deviation of coded responses to "How has your attitude toward public land changed as a result of the pandemic?

A question in the survey asked users, "Before the pandemic began, I used public lands like Fairfax County parks on average ____ per month." Response options included "0 times," "1-2 times," "3-4 times," "5-6 times" and "7+ times." The responses were coded 1 for "0 times," 2 for "1-2 times," 3 for "3-4 times" 4 for "5-6 times," and 5 for "7+ times." 34% of respondents responded that they used Fairfax County parks more than seven times per month, while 48.3% of respondents used Fairfax County parks 1-4 times a month on average (Table 4).

Table 4

Analysis of responses to the question, "Before the pandemic began, I used public lands like Fairfax County parks on average ___ per month."

Before the pandemic began, I used public land like Fairfax County parks on average ____ per month.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 times	2	6.9	6.9	6.9
	1-2 times	6	20.7	20.7	27.6
	3-4 times	8	27.6	27.6	55.2
	5-6 times	3	10.3	10.3	65.5
	7+ times	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

The mean was 3.45, showing that the majority of people used Fairfax County parks between 3 to 6 times a month, since the mean of 3.45 fell in between the codes of 3 and 4. The standard deviation was 1.352 (Figure 15).

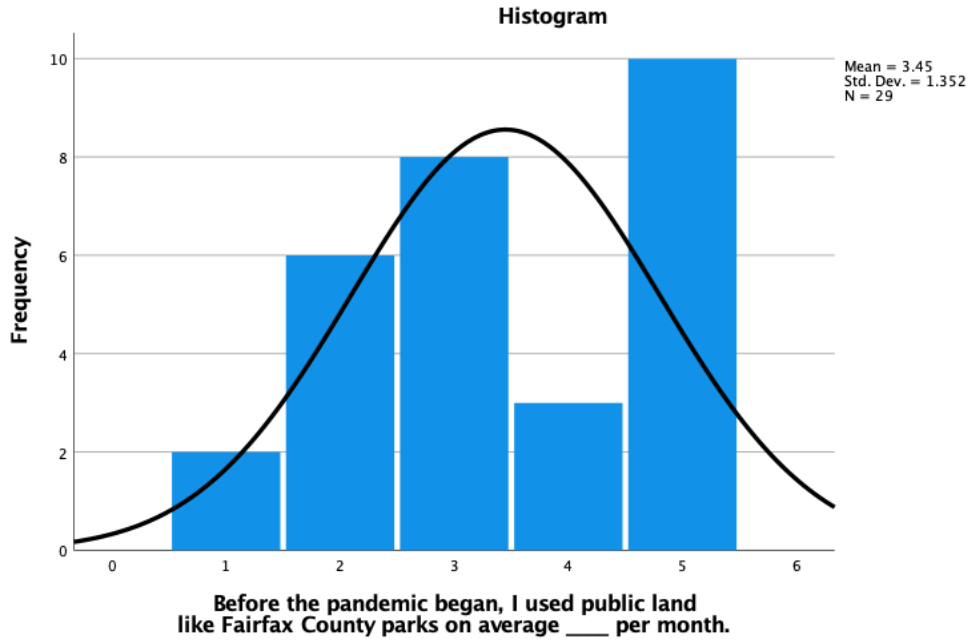

Figure 15: A histogram showing the frequency distribution of responses to the statement, "Before the pandemic began, I used public lands like Fairfax County parks on average ___ per month." Each number in the X axis represents a line of response in the survey, so 1 means "0

times," 2 means "1-2 times," 3 means "3-4 times," 4 means "5-6 times," and 5 means "7+ times."

Survey respondents were asked, "Do you use public lands like Fairfax County parks more or less per month on average since the pandemic began?" Response options were "Yes, I use it more," "No, I use it less," and "I use it bout the same." The responses were coded 1, -1, and 0, respectively. The mean was 0.34, indicating that slightly more people used public lands more, and the standard deviation was 0.67 (Figure 16).

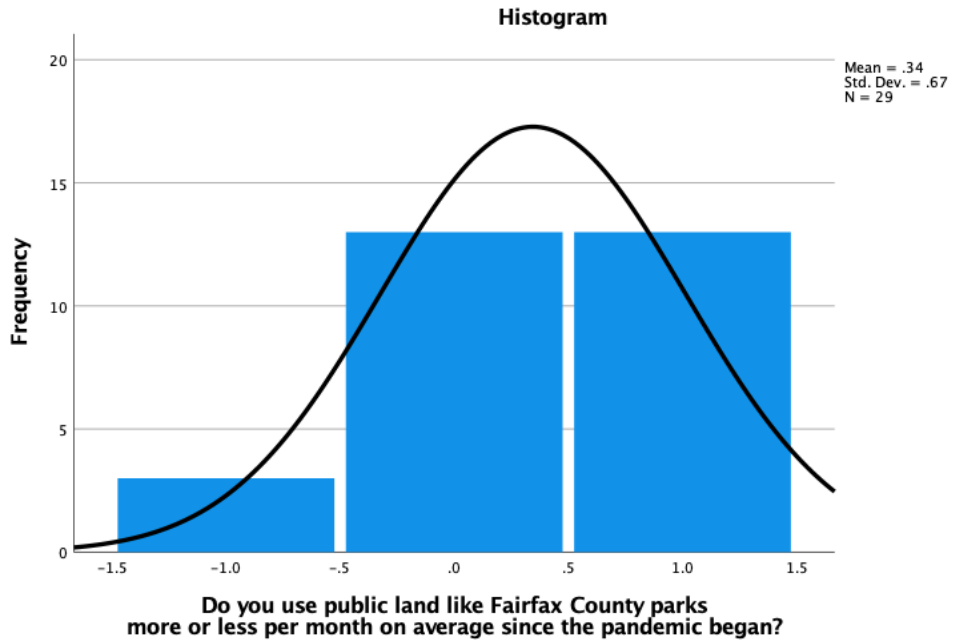

Figure 16: A graph showing the frequency distribution of responses to the question, "Do you use public lands like Fairfax County parks more or less per month on average since the pandemic began?

RQ3: To what extent do people perceive that the broad, cultural-level message that "We are all in this together" has been effective in encouraging the behaviors that flatten the COVID-19 infection curve?

Four survey questions were used to address RQ3. In an open-ended question, survey respondents were asked what "We are all in this together" meant to them. Responses were then coded using most-used phrases (Table 5). 34.5% of respondents indicated that the community needed to work together, and 24.1% of respondents said that everyone needed to do our part. Other responses included supporting one another, understanding that everyone is affected, and emphasizing that people need to think for others.

Table 5
Survey responses to "What does 'We are all in this together' mean to you?"

	Frequency	Percent
No response	1	3.4
Do our part	7	24.1
Everyone is affected	4	13.8
Support one another	6	20.7
Think for others	1	3.4
Work together	10	34.5
Total	29	100.0

Note: Responses were coded using phrases that surfaced most often.

Following the open-ended question in Table 5, respondents were asked, "In your opinion, how effective was the message that "We are all in this together" in flattening the COVID-19 infection curve in your community?" Participants were given four choices: "Very effective," "Moderately effective," "Slightly effective," and "Not at all effective." The responses were coded 4, 3, 2, and 1, respectively. Table 6 shows that the median was 3.00, indicating most respondents chose "Very effective" or "Moderately effective." The standard deviation was 0.759.

Table 6

Coded 4 for very effective, 3 for moderately, 2 for slightly, 1 for not at all effective. Reported mean and standard deviation of survey responses.

Statistics

In your opinion, how effective was the message that "We are all in this together" in flattening the COVID-19 infection curve in your community?

Mean	2.83
Median	3.00
Std. Deviation	.759

Participants were asked to take a moment of introspection and consider the question, "In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g., wearing a mask, staying six feet apart, teleworking)" The responses and codes were the same: "Very effective," "Moderately effective," "Somewhat effective," and "Not at all effective." The responses were coded 4 for "Very effective," 3 for "Moderately effective," 2 for "Somewhat effective," and 1 for "Not at all effective." Table 7 shows a mean of 3.07 and a standard deviation of 1.033, thus the mean hovered around "moderately effective".

Table 7

Analyses for responses to the question "In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet apart, teleworking)

Statistics

In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet apart, teleworking.)

Mean	3.07
Median	3.00
Std. Deviation	1.033

Next, participants were asked, "In your opinion, how effective is the message of "We are all in this together" in encouraging the general community to work together to keep each other safe from a widespread and shared danger?" Again, the responses were "Very effective," "Moderately effective," "Somewhat effective," and "Not at all effective." The responses were coded 4 for "Very effective," 3 for "Moderately effective," 2 for "Somewhat effective," and 1 for "Not at all effective." Table 8 shows a mean of 3.00 and a standard deviation of 0.845.

Table 8

Analyses for responses to the question "In your opinion, how effective is the message of "We are all in this together" in encouraging the general community to work together to keep each other safe from a widespread and shared danger?"

Statistics

In your opinion, how effective is the message of "We are all in this together" in encouraging the general community to work together to keep each other safe from a widespread and shared danger?

Mean	3.00
Median	3.00
Std. Deviation	.845

RQ4: Does receptivity to "We are all in this together" messaging make one more receptive to climate change mitigation?

Four survey questions were associated with RQ4. Survey respondents were asked, in their opinion, how similar the COVID-19 pandemic was to the climate change crisis. Responses to the open-ended question were analyzed and categorized based on the information given (Table 9). 10.3% of the respondents responded negatively, one calling the pandemic and the climate change crisis "fear mongering lies." 6.9% of respondents said that they were unsure and unfamiliar with the topic. 24.1% of the respondents said that they felt that the pandemic and climate change were very similar.

Table 9
Open-ended responses to "How similar is the COVID-19 pandemic to the climate change crisis?"

	Frequency	Percent
No response	2	6.9
Negative response	3	10.3
Not similar	3	10.3
Not similar at all	5	17.2
Somewhat not similar	5	17.2
Somewhat similar	2	6.9
Unsure	2	6.9
Very similar	7	24.1
Total	29	100.0

The survey then asked participants their thoughts and beliefs on climate change. One question asked, "Before the pandemic, I was ____ about fighting climate change." The options for responses were as follows: "Very concerned," "Moderately concerned," "Somewhat concerned," and "Not at all concerned." The responses were coded 4, 3, 2, and 1 respectively.

Table 10 shows a mean of 3.00 and a standard deviation of 1.035. Thus, the mean is around "Moderately concerned."

Table 10
Analyses for responses to the statement, "Before the pandemic, I was _____ about fighting climate change."

Statistics

Before the pandemic, I was _____ about fighting climate change.	
Mean	3.00
Median	3.00
Std. Deviation	1.035

The next question asked, "Since the pandemic, I am ____ about fighting climate change." The response options were the same: "Very concerned," "Moderately concerned," "Somewhat concerned," and "Not at all concerned." There was a slight increase in the mean and standard deviation, at 3.10 and 1.047 respectively (Table 11), indicating that there may have been a small increase in climate change concerns in some individuals since the beginning of the pandemic.

Table 11
Analyses for responses to the statement, "Since the pandemic, I am ____ about fighting climate change."

Statistics

Since the pandemic, I am _____ about fighting climate change.	
Mean	3.10
Median	3.00
Std. Deviation	1.047

The final question of the survey asked, "How important is it to you that society works to minimize climate change impacts?" The responses were coded as 4 for "Very important," 3 for "Moderately important," 2 for "Somehow important," and 1 for "Not at all important." The mean

was 3.41 with a standard deviation of 0.946 (Table 12), with the mean hovering between "Very important" and "Moderately important."

Table 12
Analyses for responses to the question, "How important is it to you that society works to minimize climate change impacts?

Statistics

How important is it to you that society works to minimize climate change impacts?

Mean	3.41
Median	4.00
Std. Deviation	.946

Discussion and Recommendations

The research asked four questions that were answered either through quantitative data collected by Fairfax County Park Authority, or through an independent survey distributed to users of Fairfax County Parks.

The first research question (RQ1) asks, "To what extent did the COVID-19 pandemic affect managed park visitation in Fairfax County, namely in terms of camping, classes, and recreation?" The tables and figures were grouped by facility type. Table 1 showed yearly data totals from 2017 to 2020 in relation to vehicle counts, campsite rentals, amusement tickets, and boat rentals for lakefront parks. With regard to campsite rentals, amusement tickets, and boat rentals, numbers were lower in 2020 than in previous years although that may have been in part due to travel restrictions and self-imposed limitations by the Park Authority. Vehicle counts showed a spike in the summer months and in general trended higher than in previous years.

The second facility type, golf courses, showed some similar trends as lakefront parks. The data was only available from 2018 to 2020. Aside from April and May, the number of golf rounds sold was in general higher per month than in previous years. As mentioned, miniature golf courses were being renovated, so there were no rounds sold in 2020. Classes were slow to take off and were lower than in previous years, and so were tournaments and special events, although that may have been in part due to restrictions put in place by Fairfax County Park Authority.

The third and final facility type analyzed, recreational centers, or RECenters, suffered during the pandemic. Unlike lakefront parks and golf courses, RECenters don't have much in the way of outdoor recreation, and thus were bound by restrictions put forth by the Commonwealth of Virginia (Forward Virginia Guidelines, 2020). As a result, users were required to make reservations and the total occupancy in the buildings were significantly lower than pre-pandemic

times. For example, compared to 2019, there was a 66% decrease in general pass admissions at RECenters.

Survey respondents were asked, “During the COVID-19 pandemic, I observed an increase in park attendance.” The responses were coded as -1, 0, and 1, with 1 being “Yes, I observed an increase in park attendance,” and -1 being “No, park attendance decreased.” The mean was 1.21. In this case, a positive mean indicated that most respondents observed an increase in park attendance during the pandemic.

The second question (RQ2) asks, “To what extent did the broad, cultural-level message that ‘we are all in this together’ affect people’s use of public lands?” Survey respondents were asked four questions related to RQ2. The first question was “How has attitudes toward public lands such as Fairfax County Parks changed as a result of the pandemic?” Most respondents responded that there was either no change, or a positive change. None of the respondents indicated that attitudes toward public lands had worsened.

The second question asked respondents, “Before the pandemic, I used public lands like Fairfax County Parks on average ____ per month.” 34% of respondents indicated that they used public lands more than seven times a month. Figure 15 reported a mean of 3.45, indicating that most people used public lands 3 to 6 times a month.

Respondents then answered the question, “Do you use public lands like Fairfax County Parks more or less per month since the pandemic began?” The mean was 0.34, meaning that there was slightly more use of public lands since the beginning of the pandemic.

The third question (RQ3) asks, “To what extent do people perceive that the broad, cultural-level message that ‘we are all in this together’ has been effective in encouraging behaviors that flatten the COVID-19 infection curve?”

Respondents were asked to be introspective and explain their thoughts in an open-ended answer to the question, “What does “We are all in this together” mean to you?” The responses were then coded based on most frequently used words or phrases. 34.5% of respondents indicated that the community needed to work together, and 24.1% indicated that everyone needed to do their part. Overall, the response to “We are all in this together” was that people needed to work together and be understanding of circumstances and that each person’s struggle might be different.

Respondents were asked their opinion on how effective the message of “We are all in this together” in flattening the COVID-19 infection curve in their communities. The median was 3, indicating that most respondents chose “Very effective” or “Moderately effective.” They were then asked a similar question, but in regard to the message “We are all in this together” in changing their own behavior to participate in social distancing. The mean was 3.07, meaning that most people chose “Moderately effective” or “Very effective.” The final question for RQ3 asked, “In your opinion, how effective is the message of “We are all in this together” in encouraging the general community to work together to keep each other safe from a widespread and shared danger?” The mean was 3.00, signaling that most people leaned toward “Moderately effective.”

The final question (RQ4) asks, “Does receptivity to ‘we are all in this together’ messaging make one more receptive to climate change mitigation?” Survey respondents were asked, in their opinion, how similar the COVID-19 pandemic was to the climate change crisis. It was another open-end question, and responses were coded based on most frequently used words and phrases. 10.3% of the responses were negative, using language such as “fear mongering lies.” However, 24.1% of respondents felt that the pandemic and the climate change crisis were

very similar, namely in terms of how the community needed to work together to reach their goals – by flattening the COVID-19 curve in one case and reducing carbon emissions in another case.

Respondents were then asked their concerns about fighting climate change before the pandemic, and since the pandemic. The responses are shown in Table 10 and Table 11, with a mean of 3.00 and 3.10, respectively. The small increase in the mean shows that there has been some positive response to fighting climate change since the start of the pandemic.

The last question asked respondents, "How important is it to you that society works to minimize climate change impacts?" The mean was 3.41, in between "Very important" and "Moderately important."

While we hope that it will not be long-lasting, we need to consider the far-reaching impacts of the COVID-19 pandemic. The quantitative results shows that while the number of participants in activities such as boating, camping, and riding carousels are down, ultimately outdoor recreational areas such as lakefront parks and golf courses are observing an increase in park visitation through other methods, such as the number of golf rounds purchased and car counts. RECenters, however, show a significant decrease in visitation, mainly due to indoor restrictions due to the pandemic.

The survey asked respondents how the message that "We are all in this together" affected people's use of public lands. People's attitudes toward public lands improved a little bit, while self-reported park use among respondents either held stable or increased since the beginning of the pandemic. The survey responses did not reflect the actual usage data from the parks. The usage data from the parks showed a spike in park visitation at golf courses and lakefront parks. The mean for self-reported park use among respondents since the beginning of the pandemic was 0.34, indicating a slight increase in park use.

Responses to the survey show that the majority of survey participants believe that the message of "We are all in this together" is helpful in order to flatten the curve. Survey respondents indicated that they deem that, in order to manage the effects of the COVID-19 disease, it is important to work together, give each other support, and be understanding that everyone is experiencing the pandemic differently. Most of the survey respondents were at least moderately concerned about fighting climate change, either before or after the start of the pandemic. Respondents believed that it was at least moderately important for society to work together to minimize climate change impacts. However, many respondents did not see a definite link between the COVID-19 pandemic and climate change. This may have been due to the vagueness of the question. Instead, the research could have asked respondents whether they thought some sort of broad, cross-cultural messaging similar to "We are all in this together" would have been helpful in reducing or mitigating climate change.

There were some limitations to the study. First of all, the study took place during the still-unfolding pandemic, and it has impacted the data collective. At the time of this writing, it is December 2020 and facility data collection are only updated until October, so the total 2020 quantitative data is not complete. While it is unlikely that there is a spike in golf round purchases, park visitation, or RECenter general admission passes, the data is not conclusive until all of the numbers have been collected and tabulated. Furthermore, the survey itself had some questions that could have been worded better; in particular, the open-ended question regarding to whether respondents saw similarities between the COVID-19 pandemic and the climate change crisis. If the question had been reworded to ask, "Do you believe that there are similarities between the COVID-19 pandemic and the climate change crisis in how the government handles both crises or public perceptions?" then perhaps the responses would have been more consistent

or had more content to work with. Another limitation was that the survey didn't have as far of a reach as expected. There were only twenty-nine respondents. While the survey respondents ranged in age from 18 to 70 (Table 13), 69% of respondents identified as female (Table 14).

Table 13

Age of survey respondents

What is your age?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18.00	1	3.4	3.4	3.4
	21.00	1	3.4	3.4	6.9
	22.00	1	3.4	3.4	10.3
	23.00	1	3.4	3.4	13.8
	24.00	1	3.4	3.4	17.2
	25.00	1	3.4	3.4	20.7
	26.00	1	3.4	3.4	24.1
	40.00	2	6.9	6.9	31.0
	41.00	2	6.9	6.9	37.9
	42.00	3	10.3	10.3	48.3
	44.00	2	6.9	6.9	55.2
	48.00	1	3.4	3.4	58.6
	50.00	1	3.4	3.4	62.1
	51.00	1	3.4	3.4	65.5
	53.00	1	3.4	3.4	69.0
	54.00	1	3.4	3.4	72.4
	55.00	1	3.4	3.4	75.9
	58.00	1	3.4	3.4	79.3
	61.00	1	3.4	3.4	82.8
	62.00	1	3.4	3.4	86.2
	63.00	1	3.4	3.4	89.7
	64.00	1	3.4	3.4	93.1
	65.00	1	3.4	3.4	96.6
	70.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

Table 14
Gender of survey respondents

With which gender do you most identify?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	9	31.0	31.0	31.0
	Female	20	69.0	69.0	100.0
	Total	29	100.0	100.0	

The implications of this research may only be confined to Fairfax County Park Authority and the surrounding municipalities, due to the population density and similarities in natural resources. However, armed with this information and figures, Park employees may have the tools to plan ahead and prepare for another shutdown. It is apparent that the public craves spending time outdoors in a socially distanced setting, so in the case that there is another shutdown, perhaps Park employees would have resources to share with the public to encourage them to explore their environment in a safe setting.

There are a variety of treatment options that promote behavior changes, such as cognitive dissonance, using rewards, setting goals, and prompts (Osbaldiston & Schott, 2012). Individual treatment methods do not work well on their own but are more effective when paired with other treatment methods (Osbaldiston & Schott, 2012). Since the beginning of the pandemic, public places, various websites, and media have regularly reminded users to wear masks, stay six feet away from each other, minimize the number of individuals indoors, and to wash hands. Almost all of these reminders include the message, “We are all in this together,” either worded as such or differently but to give the same effect. The reminders serve as prompts and justifications, in that they remind people to wear masks and wash their hands but justify it by explaining how the

coronavirus disease is spread. The number of cases declined throughout the summer before beginning to increase again in September 2020 (Daily Trends in Number of COVID-19 Cases in the United States Reported to CDC, 2020). Social media is utilizing social dissonance to encourage people to stay home and to stay safe through social media shaming (Compton, 2020), which has not proven to be effective on its own, as airports documented a new pandemic-era record over Thanksgiving as people traveled to be with their families (McMahon, 2020). Social dissonance on its own has been shown not to work in terms of minimizing the spread of COVID-19, but pairing prompts and justifications has. If these treatments are be applied toward modifying behavior to mitigate climate change, it may be helpful in reducing carbon emissions and increasing people's "green footprints." The prompts could include a cross-cultural message similar to "We are all in this together" along with encouraging people to take public transportation where possible and make small but sustainable swaps within households that will reduce waste and decrease carbon footprints and justifying it with personal and broad reasons.

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Appendix A

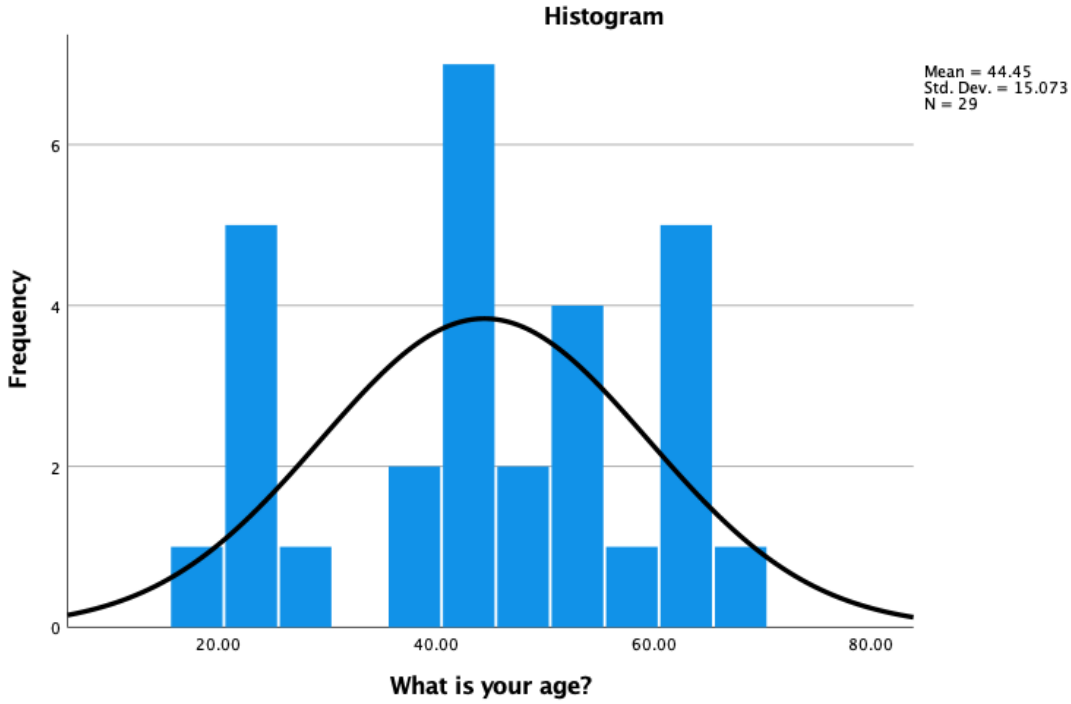

Figure 17: Histogram showing survey respondents by age

Table 15

Regression – concern about fighting climate change is predicted by the effectiveness of the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet away, teleworking.)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.522[a]	.272	.245	.910

a. Predictors: (Constant), In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet apart, teleworking.)

Table 16

ANOVA – concern about fighting climate change is predicted by the effectiveness of the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet away, teleworking.)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.352	1	8.352	10.096	.004[b]
	Residual	22.337	27	.827		
	Total	30.690	28			

a. Dependent Variable: Since the pandemic, I am _____ about fighting climate change.

b. Predictors: (Constant), In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet apart, teleworking.)

Table 17

Regression – concern about fighting climate change is predicted by the respondent's attitude toward public land.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.150[a]	.022	-.014	1.054

a. Predictors: (Constant), How has your attitude toward public land changed as a result of the pandemic?

b. Dependent Variable: Since the pandemic, I am _____ about fighting climate change.

Table 18

ANOVA – concern about fighting climate change is predicted by the respondent's attitude toward public land.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.690	1	.690	.621	.438[b]
	Residual	30.000	27	1.111		
	Total	30.690	28			

a. Dependent Variable: Since the pandemic, I am _____ about fighting climate change.

b. Predictors: (Constant), How has your attitude toward public land changed as a result of the pandemic?

Table 19

Regression – concern about fighting climate change is predicted by the respondent's self-reported use of public land since the pandemic began.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.151[a]	.023	-.013	1.054

a. Predictors: (Constant), Do you use public land like Fairfax County parks more or less per month on average since the pandemic began?

b. Dependent Variable: Since the pandemic, I am _____ about fighting climate change.

Table 20

ANOVA – concern about fighting climate change is predicted by the respondent's self-reported use of public land since the pandemic began.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.701	1	.701	.631	.434[b]
	Residual	29.989	27	1.111		
	Total	30.690	28			

a. Dependent Variable: Since the pandemic, I am _____ about fighting climate change.

b. Predictors: (Constant), Do you use public land like Fairfax County parks more or less per month on average since the pandemic began?

Table 21

Independent samples t-test with gender and whether self-reported attitude toward public land has changed as a result of the pandemic.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
How has your attitude toward public land changed as a result of the pandemic?	Equal variances assumed	4.293	.048	1.977	27	.058	.356	.180	-.014	.725
	Equal variances not assumed			1.794	12.567	.097	.356	.198	-.074	.785

Table 22

Independent samples t-test with gender and whether self-reported usage toward public land has changed as a result of the pandemic.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Do you use public land like Fairfax County parks more or less per month on average since the pandemic began?	Equal variances assumed	.710	.407	1.805	27	.082	.467	.259	-.064	.997
	Equal variances not assumed			2.047	21.232	.053	.467	.228	-.007	.941

Table 23

Independent samples t-test with gender and perceived effectiveness of "We are all in this together" in flattening the COVID-19 infection curve.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
In your opinion, how effective was the message that "We are all in this together" in flattening the COVID-19 infection curve in your community?	Equal variances assumed	.553	.463	.287	27	.776	.089	.310	-.547	.725
	Equal variances not assumed			.285	15.243	.780	.089	.312	-.575	.753

Table 24

Independent samples t-test with gender and perceived effectiveness of "We are all in this together" in changing the respondent's behavior to participate in social distancing.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E. g. wearing a mask, staying six feet apart, teleworking.)	Equal variances assumed	.344	.562	-1.434	27	.163	-.583	.407	-1.418	.252
	Equal variances not assumed			-1.354	13.636	.198	-.583	.431	-1.510	.343

Table 25

Independent samples t-test with gender and perceived effectiveness of "We are all in this together" in encouraging the respondent's community to work together to keep each other safe.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
In your opinion, how effective is the message of "We are all in this together" in encouraging the general community to work together to keep each other safe from a widespread and shared danger?	Equal variances assumed	1.071	.310	-.468	27	.643	-.161	.344	-.867	.545
	Equal variances not assumed			-.492	17.485	.629	-.161	.327	-.851	.528

Table 26

Independent samples t-test with gender and the respondent's attitude toward fighting climate change before the pandemic.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Before the pandemic, I was _____ about fighting climate change.	Equal variances assumed	.930	.344	-.770	27	.448	-.322	.419	-1.181	.537
	Equal variances not assumed			-.708	12.889	.492	-.322	.455	-1.307	.662

Table 27

Independent samples t-test with gender and the respondent's attitude toward fighting climate change since the pandemic.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Since the pandemic, I am _____ about fighting climate change.	Equal variances assumed	.024	.878	-.734	27	.469	-.311	.424	-1.181	.558
	Equal variances not assumed			-.693	13.599	.500	-.311	.449	-1.277	.655

Table 28

Independent samples t-test with gender and the importance of society working together to minimize climate change impacts to the respondent.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
How important is it to you that society works to minimize climate change impacts?	Equal variances assumed	.033	.858	.115	27	.909	.044	.386	-.748	.837
	Equal variances not assumed			.112	14.480	.913	.044	.398	-.807	.895

Appendix B

Survey Type: Cross sectional – collect data at one point in time online.
Time: Fall 2020
Thoughts and considerations: attitudes & practices, community needs, program evaluation, group comparison, national assessment
Population: People affiliated with Fairfax County somehow
Target population: People who work for Fairfax County Park Authority
Survey Questions:

1. What is your age?
    a. (open ended)
2. With which gender do you most identify?
    a. Male
    b. Female
    c. Gender Variant/Non-conforming
    d. Prefer not to say
3. During the COVID-19 pandemic, I observed an increase in park attendance at Fairfax County parks?
   Strongly agree, Agree, Disagree, Strongly Disagree
4. Has your attitude toward public land improved as a result of the pandemic?
   Yes, improved; No, worsened; Stayed the same
5. Before the pandemic began, I used public land like Fairfax County parks ____, on average, per month.
   0, 1-2 times, 3-4 times, 4-5 times, 6+ times
6. Do you use public land like Fairfax County parks more or less per month on average since the pandemic began?
   Yes, I use it more; No, I use it less; I use it about the same
7. What does "We are all in this together" mean to you?
    a. (open ended)
8. In your opinion, how effective was the message that "We are all in this together" in flattening the COVID-19 infection curve in your community?
9. In your opinion, how effective was the message of "We are all in this together" in changing your own behavior to participate in social distancing? (E.g. wearing a mask, staying six feet away, teleworking.)
   Very effective, Moderately effective, Slightly effective, Not at all effective
10. In your opinion, how effective is the message of "We are all in this together" in encouraging the general community to work together to keep each other safe?
    Very effective, Moderately effective, Slightly effective, Not at all effective
    Very effective, Moderately effective, Slightly effective, Not at all effective
11. In your opinion, how similar is the COVID-19 pandemic to the climate change crisis? (could probably word this better)
    (Open ended)
12. Before the pandemic, I was _____ about fighting climate change.
    Very concerned, Moderately concerned, Slightly concerned, Not at all concerned
13. Since the pandemic, I am _____ about fighting climate change.
    Very concerned, Moderately concerned, Slightly concerned, Not at all concerned

14. How important is it to you that society works to minimize climate change impacts?
    Very important, Moderately important, Slightly important, Not at all important